



ROBOTICS UPDATE

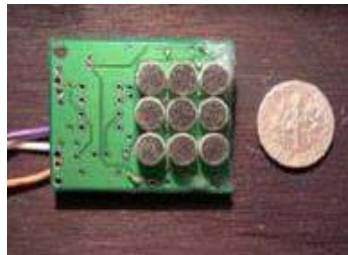
"Providing network-integrated robotic solutions for C4ISR applications."

www.spawar.navy.mil/robots/

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CCAT Funds Enhanced Robotic Functionalities

In late 2002, the DARPA Tactical Mobile Robot (TMR) program was transitioned to SSC San Diego to facilitate incorporation of program accomplishments into ongoing DoD developmental efforts. Initial successes led to the formal establishment of the Robotics Technology Transfer Project (TechXFR), funded by the OSD Joint Ground Robotics Enterprise (JGRE). The near-term objective was to increase the functionality and autonomy of man-portable robots, while simultaneously reducing the operator burden associated with teleoperated control.



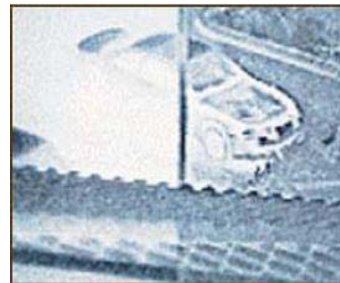
The AETC acoustic sensor has a signal-to-noise ratio (SNR) that is 5 dB better than conventional microphones.

The TechXFR approach is to evaluate component technologies on prototype test platforms, fuse contemporary methods into an optimal solution, and then port results to legacy systems used in theater. Our principle focus was thus shifted from continued development of more technology towards the expedited transition of useable results to the warfighter.

To expand upon this promising concept, SSC San Diego has partnered with the Center for Commercialization of Advanced Technology (CCAT) to assist entrepreneurs in the transition of promising technology solutions. (Other key collaboration partners include the Idaho National Laboratory (INL), the Jet Propulsion Laboratory (JPL), and SRI International.)

CCAT is a DoD-supported effort to help advanced technologies achieve success in the marketplace. The 2007

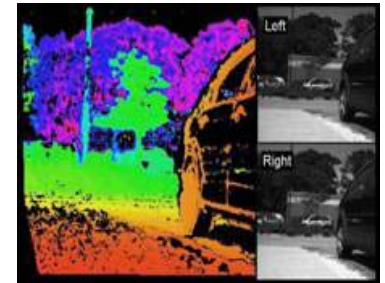
CCAT solicitation focused on proven solutions that could be quickly integrated onto field-ready man-portable robots, such as the Foster-Miller TALON and the iRobot PackBot. Managed by SSC San Diego, the CCAT program is administered out of two geographically dispersed offices, one in San Bernardino and the other in San Diego.



Digivision's video contrast-enhancement module provides improved imagery under adverse lighting.

The San Diego office, which operates out of the San Diego State University Research Foundation, follows a public-private partnership model. The San Bernardino office is a sponsored program managed and operated under the California State University San Bernardino Foundation's Office of Technology Transfer and Commercialization (OTTC).

During the summer of 2006, the CCAT program conducted a nationwide solicitation for near-term



Left and right stereo images from iRobot's visual odometry system (right), with the resultant range data (left).

technologies that could improve the effectiveness of unmanned ground vehicles (UGVs) currently used in Afghanistan and Iraq. This past October, the CCAT office in San Diego announced business development grants and support awards to five companies:

* AETC, now the Advanced Sensors and Analysis Division of SAIC, San Diego, CA, was granted a \$75,000 product-development award for their acoustic-array technology that offers improved situational awareness for UGVs. The system detects ultra-



SAIC's Birddog concept enables the robot to respond to the actions and intentions of the human.



Donnie Fellars holds the 360-degree AETC test fixture that will be evaluated on the laboratory robot ROBART III. Potential operational platforms include the Foster-Miller Swords and the iRobot Warrior.

CCAT Funds Enhanced Robotic Functionalities (cont.)

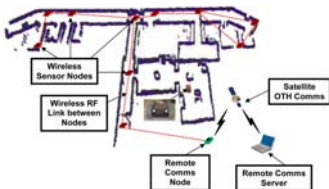


Space Micro's radiological sensor provides detection as well as relative bearing to the source.

sonic transients indicative of human presence, and can also provide a steerable-beam directional microphone for improved voice-recognition in noisy battlefield environments.

* iRobot Corporation of Burlington, MA, received a two-part product-development award totaling \$125,000 for its visual odometry system for UGVs, and for integrating a *Simultaneous Localization and Mapping (SLAM)* algorithm developed by SRI International under the DARPA TMR Program.

* The *Birddog* human-robot-interaction concept developed by SAIC of Englewood, CO, received a \$75,000 product-development award. *Birddog* enables intelligent unmanned systems to reason about the actions, intentions, and reactions of humans and respond appropriately.



Autonomous exploration and mapping software developed by SRI, INL, and SSC San Diego will support automated deployment of CornerTurn's leave-behind sensor network.

* The Domestic Security Division of San Diego-based Space Micro, Inc. was awarded a \$75,000 product-development award (as well as commercialization planning assistance and a market study) for its Radiological Source Identifier and Tracking (RADSITE™) technology. RADSITE™ is designed to detect and geometrically locate multiple radiation fields in less than 1 minute. This new feature allows the radiation sensor to influence the search strategy, leading the robot directly to the source.



Differential Mobility Analyzer (DMA) with 6-inch ruler for scale was initially developed by NanoEngineering under a US Army Phase II SBIR.

* DigiVision, also of San Diego, received a \$75,000 product-development grant for an inline contrast-enhancement system that provides improved video under adverse lighting. The physical configuration of the device allows internal installation on a variety of legacy manportable robots.

In December 2006, the Office of Technology Transfer and Commercialization (OTTC) at California State University, San Bernardino announced three additional CCAT awards:

* CornerTurn, LLC, of Corona, CA, received a \$75,000 product-development award (and market study) for their *BOTDROPS* leave-behind sensors. The goal of this project is to demonstrate



Millimeter-wave imaging radar created by Trex Enterprises is a second-generation system based upon an initial design for airborne platforms.

robotically deployed sensors that allow persistent remote surveillance of a previously cleared facility or area.

* NanoEngineering Corp., of West Palm Beach, FL received a \$75,000 product-development award (and market study) for their Differential Mobility Analyzer (DMA). This new technology, which detects volatile emissions of explosives and chemical weapons, was initially developed under an Army Small Business Innovative Research (SBIR) program. Essentially an "electronic nose," the system is three orders of magnitude more sensitive than conventional Ion Mobility Spectrometry.

* Trex Enterprises Corporation of Kahului, HI, received a \$75,000 product-development award (and market study) for their *Compact Imaging Radar System*. This technology is capable of all-weather day/night imaging in degraded visual environments such as rain, fog, and dust, where conventional sensors have limited utility.

So far, three of the eight CCAT participants have already provided their end-of-project deliverables: Space Micro (radiation sensor), SAIC Englewood (*Birddog*), and DigiVision (contrast-

enhancement system).

Engineers at SSC San Diego are working closely with all the awardees to conduct near-operational testing and evaluation of their technologies to help expedite transition to fielded robotic systems.

On 28 June, the Honorable Delores M. Etter, Assistant Secretary of the Navy (RD&A), presented the Department of the Navy "Top Scientists and Engineers Award" to Estrellina Pacis, TechXFR project manager, for her leadership role in enhancing the onboard intelligence of man-portable robots. ♦



The Honorable Delores M. Etter (left) presents the 2006 Top Scientists and Engineers Award to Estrellina Pacis of the Unmanned Systems Branch.

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